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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/752,276	12/29/2000	John Belcea	GEH-01-064	9138

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EXAMINER	
SHARON, AYAL I	

ART UNIT	PAPER NUMBER
2123	6

DATE MAILED: 06/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/752,276	BELCEA, JOHN	
	Examiner	Art Unit	
	Ayal I Sharon	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 December 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18,23-40 and 45* is/are rejected.

7)☐ Claim(s) *19-22 and 41-44* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 December 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. Claims 1-45 of U.S. Application 09/752,276 filed on 12/29/2000 are presented for examination. This application claims the priority filing date of Provisional Application 60/173,602, filed on 12/29/1999.

Drawings

2. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. **Claims 4-5, 14, 26-27, 36, and 45 are rejected under 35 U.S.C. 101 because the disclosed invention is inoperative and therefore lacks utility.**

5. Newton's Second Law is F = ma, where 'F' is Force, 'm' is mass, and 'a' is acceleration. However, the formulas in Applicant's claims violate this cardinal law of physics. Moreover, the formulas do not produce the correct resultant units. Therefore, these equations would produce incorrect ("inoperative") results.

a. Claims 4, 26, and 45 use velocity instead of acceleration in calculating $F_{(rf)}$. The resultant unit from the formula, according to the units listed in Table 1 in the specification, is (lbs *ft) / sec, which is not the correct unit for force.

b. Claims 5, 27, and 45 use velocity squared instead of acceleration in calculating $F_{(af)}$. The resultant unit from the formula, according to the units listed in Table 1 in the specification, is (lbs *ft) / sec, which is not the correct unit for force.

c. Claims 14, 36, and 45 use a "brake force" D_t which has, according to Table 1 (Specification, p.5), has units of feet. The resultant unit from the formula, according to the units listed in Table 1 in the specification, is (lbs *ft) / sec, which is not the correct unit for force.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. **Claims 6, 28, and 45 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.**

8. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed

invention. The "elevation functions" used to calculate $F_{(ef)}$ are not described in the specification.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 4-14, 26-36, and 45 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

11. The parameters in the claimed equations are not defined in the bodies of the claims. Therefore the parameters are undefined, and thus indefinite.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. The prior art used for these rejections is as follows:

14. Gruber, P. et al., "Suboptimal Control Strategies for Multilocomotive Powered Trains". IEEE Transactions on Automatic Control. June 1982. Vol.27, Issue 3, pp.536-546. (Henceforth referred to as "**Gruber**").

15. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

16. Claims 1-3, 15-16, 23-25, and 37-38 are rejected under 35 U.S.C. 102(b) as being anticipated by Gruber.

17. In regards to claim 1, Gruber teaches the following limitations:

1. A method for predicting train consist reactions to specific stimuli using a system including at least one measurement sensor located on a train consist, a data base, and a computer, the train consist including at least one locomotive and at least one railcar, said method comprising the steps of:

collecting sensor data as the consist is moving;
(Gruber, especially: Section I, "Introduction", col.1 last paragraph – col.2, first paragraph)

Gruber teaches in the cited paragraph that:

"The control strategies developed in this paper are based on the assumptions that electro-pneumatic brakes are available and that there exists an exchange of information along the train [2]. The objective of the control is to minimize the coupler forces which results in safer operation or in increased traveling speeds."

determining a consist force balance utilizing the sensor data and the computer;
(Gruber, especially: Abstract, and Section II "Model")

Gruber teaches the following in the abstract:

"This paper introduces two different controllers for the handling of very long multi-powered trains, including braking operations. The purpose of the controller is to minimize coupler forces and velocity deviations from reference values due to grade changes and other disturbances."

Gruber teaches the following in Section II:

"If *v* represents the actual velocity vector and *u* the actual input vector consisting of throttling and braking forces, then the deviations from nominal values are defined by

$\delta v = v - {}^0v$ **and** $\delta u = u - {}^0u$

The nominal velocity ^0v is maintained by ^0u, which is equal to the resistance and gravity forces"

determining a set of consist coefficients using the computer; and
(Gruber, especially: Abstract, and Section II "Model")

Examiner finds that the "actual velocity vector" and "actual input vector ... of throttling and braking forces" corresponds to the claimed "coefficients".

predicting train consist kinetic characteristic values using the consist force balance and the set of consist coefficients.
(Gruber, especially: Abstract, and Section II "Model")

Examiner finds that the model described in detail in Section II predicts train consist kinetic characteristics.

18. In regards to claim 2, Gruber teaches the following limitations:

2. A method in accordance with Claim 1 wherein said step of collecting sensor data comprises the steps of:

monitoring a force applied to the consist utilizing the at least one measurement sensor;
(Gruber, especially: Abstract")

Gruber teaches the following in the abstract:

"This paper introduces two different controllers for the handling of very long multi-powered trains, including braking operations. The purpose of the controller is to minimize coupler forces and velocity deviations from reference values due to grade changes and other disturbances."

generating force data with respect to the force applied; and
(Gruber, especially: Abstract, and Section II "Model")

Gruber teaches the following in Section II:

"If *v* represents the actual velocity vector and *u* the actual input vector consisting of throttling and braking forces, then the deviations from nominal values are defined by

$\delta v = v - {}^{0}v$ **and** $\delta u = u - {}^{0}u$

The nominal velocity ^{0}v is maintained by ^{0}u, which is equal to the resistance and gravity forces"

communicating the force data to the computer.

(Gruber, especially: Abstract, and Section II "Model")

Examiner finds the communication of the sensor data to the controller to be inherent in a control system, otherwise the control system will not be able to function.

19. In regards to claim 3, Gruber teaches the following limitations:

3. A method in accordance with Claim 1 wherein said step of determining a consist force balance comprises the step of determining a set of consist kinetic elements.
(Gruber, especially: Abstract, and Section II "Model")

Gruber teaches the following in the abstract:

"This paper introduces two different controllers for the handling of very long multi-powered trains, including braking operations. The purpose of the controller is to minimize coupler forces and velocity deviations from reference values due to grade changes and other disturbances."

Gruber teaches the following in Section II:

"If *v* represents the actual velocity vector and *u* the actual input vector consisting of throttling and braking forces, then the deviations from nominal values are defined by

$\delta v = v - {}^{0}v$ **and** $\delta u = u - {}^{0}u$

The nominal velocity ^{0}v is maintained by ^{0}u, which is equal to the resistance and gravity forces"

Examiner finds that the velocity and force vectors correspond to the claimed "set of kinetic elements".

20. In regards to claim 15, Gruber teaches the following limitations:

15. A method in accordance with Claim 3 wherein said step of determining a set of kinetic elements further comprises the step of determining traction force.
(Gruber, especially: Section II "Model")

Gruber teaches the following in Section II:

"If *v* represents the actual velocity vector and *u* the actual input vector consisting of throttling and braking forces, then the deviations from nominal values are defined by

$\delta v = v - {}^0v$ and $\delta u = u - {}^0u$

The nominal velocity ${}^0v$ is maintained by ${}^0u$, which is equal to the resistance and gravity forces"

Examiner finds that the velocity and force vectors correspond to the claimed "set of kinetic elements".

21. In regards to claim 16, Gruber teaches the following limitations:

16. A method in accordance with Claim 3 wherein said step of determining a force balance further comprises the step of summing the set of consist kinetic elements.
(Gruber, especially: Section II "Model")

Gruber teaches the following in Section II (col.1, p.538):

"The linearized drag terms can be neglected compared with the damping forces associated with c_c and c_L, respectively. For the input u, the constraints are given by

$u_i = {}^0u_i + \delta u_i \leq 0 \quad i = 2, \ldots, m-1, m+1, \ldots, n-1$"

Examiner finds that this equation corresponds to the claimed "step of summing the set of kinetic elements".

22. **Claims 23-25 and 37-38 are rejected based on the same reasoning as claims 1-3 and 15-16, *supra*. Claims 23-25 and 37-38 are system claims reciting the equivalent limitations as are recited in method claims 1-3 and 15-16 and taught throughout Gruber.**

Claim Rejections - 35 USC § 103

23. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

24. The prior art used for these rejections is as follows:

25. Gruber, P. et al., "Suboptimal Control Strategies for Multilocomotive Powered Trains". IEEE Transactions on Automatic Control. June 1982. Vol.27, Issue 3, pp.536-546. (Henceforth referred to as "**Gruber**").

26. Claerbout. "Spectral Factorization". Earth Soundings Analysis: Processing versus Inversion (PVI). © 1992. Posted on Internet 10/21/1998. (Henceforth referred to as "**Claerbout PVI**").

27. Claerbout. "Confidence Intervals" and "Data Modeling by Least Squares". Fundamentals of Geophysical Data Processing (FGDP). © 1976. Posted on Internet 10/21/1998. (Henceforth referred to as "**Claerbout FGDP**").

28. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

29. **Claims 17-18 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber in view of Claerbout FGDP and further in view of Claerbout PVI.**

30. In regards to claim 17:

> 17. A method in accordance with Claim 1 wherein said step of determining a set of consist coefficients comprises the step of using a least squares method to determine consist coefficients.

Gruber teaches that "Previous analytical studies have been concentrated either on the control of the brakeless operation or on nominal trajectory or schedule calculations. The solution paths for these designs are summarized in Fig.1" (See Section I "Introduction", p.536, col.2).

Moreover, among the paths shown in Fig.1, "Path 2 was taken by Barry and Davis [5], [6]. They used a distributed parameter model of the train and designed an optimal controller by spectral factorization."

Gruber does not expressly teach the use of a "least squares method to determine consist coefficients."

The Claerbout PVI reference, in its "Spectral Factorization" article, on the other hand, teaches that "The **Kolmogoroff** method of spectral factorization, which we will be looking at here, is much faster than the time-domain, least-squares methods considered in chapter (–) and the least squares method given in FGDP. Its speed motivates its widespread practical use."

The cited Claerbout FGDP reference teaches the use of the least squares method to determine coefficients in the section titled "Data Modeling by Least Squares."

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Gruber with those of the Claerbout FGDP, because Claerbout PVI teaches that the use of the least-squares method was a well-known step backwards in the art.

31. In regards to claim 18,

18. A method in accordance with Claim 17 wherein said step of using the least squares method comprises the steps of:
weighting data;
solving the system;
and determining a confidence measure.

Gruber teaches that "Previous analytical studies have been concentrated either on the control of the brakeless operation or on nominal trajectory or schedule calculations. The solution paths for these designs are summarized in Fig.1" (See Section I "Introduction", p.536, col.2).

Moreover, among the paths shown in Fig.1, "Path 2 was taken by Barry and Davis [5], [6]. They used a distributed parameter model of the train and designed an optimal controller by spectral factorization."

Gruber does not expressly teach the use of a "least squares method to determine consist coefficients."

The Claerbout PVI reference, in its "Spectral Factorization" article, on the other hand, teaches that "The **Kolmogoroff** method of spectral factorization, which we will be looking at here, is much faster than the time-domain, least-squares methods considered in chapter (–) and the least squares method given in FGDP. Its speed motivates its widespread practical use."

The cited Claerbout FGDP reference teaches the use of the least squares method to determine coefficients in the section titled "Data Modeling by Least Squares." This includes weighing data (see the section titled "Weights and Coefficients") and solving the system (see the section titled "Fewer Equations

than Unknowns"). In addition, Claerbout FGDP also teaches the use of Confidence Intervals in an article titled "Confidence Intervals" in the section "Resolution".

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Gruber with those of the Claerbout FGDP, because Claerbout PVI teaches that the use of the least-squares method was a well-known step backwards in the art.

32. **Claims 39-40 are rejected based on the same reasoning as claims 17-18, *supra*. Claims 39-40 are system claims reciting the equivalent limitations as are recited in method claims 17-18 and taught throughout Gruber.**

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (703) 306-0297. The examiner can normally be reached on Monday through Thursday, and the first Friday of a biweek, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on (703) 305-9704. Any response to this office action should be mailed to:

Director of Patents and Trademarks
Washington, DC 20231

Hand-delivered responses should be brought to the following office:

4th floor receptionist's office
Crystal Park 2
2121 Crystal Drive
Arlington, VA 22202

The fax phone number is: (703) 872-9306

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist, whose telephone number is: (703) 305-3900.

Ayal I. Sharon

Art Unit 2123

June 10, 2004

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER